

Theme 3

Environmental challenges

CASE STUDY 8: The Amazon Tropical rainforest, Brazil

A case study of one ecosystem: Processes, benefits for people, impact of human activity and management.

Location - The Amazon rainforest is located in South America.

Some key facts about the Amazon rainforest.

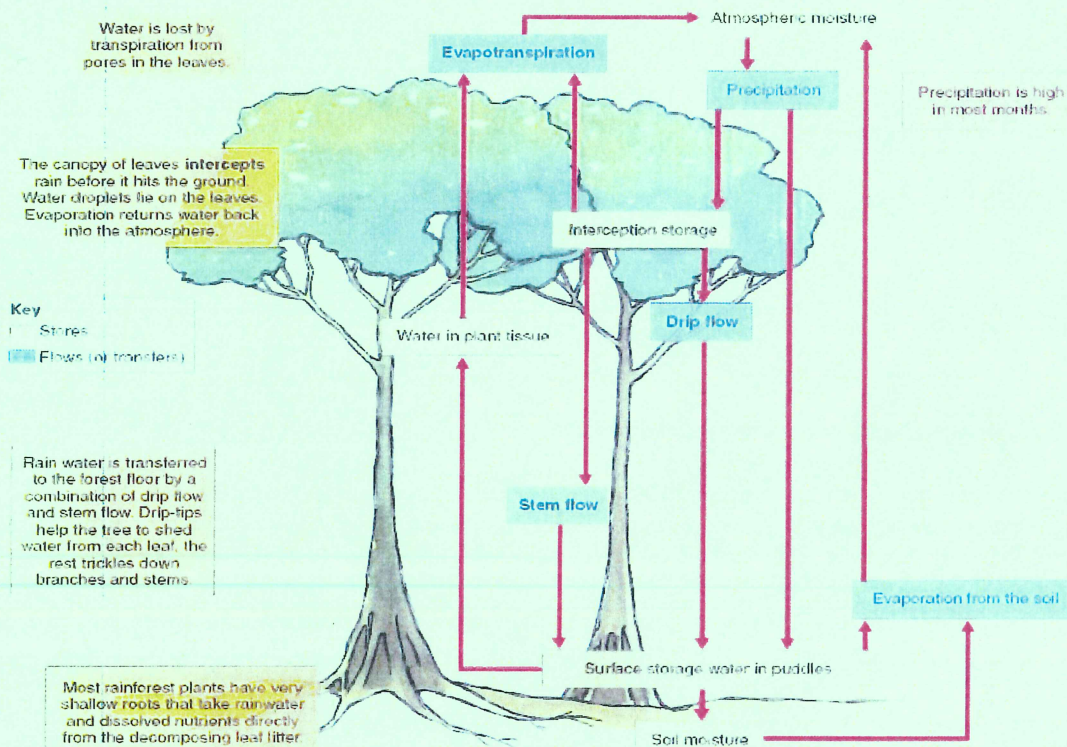
- It is 5.5 million square kilometres in size.
- The land is mainly used for grazing cattle and growing soya beans.
- It is estimated that more 1/3 rd of all species live in the Amazon rainforest
- Indigenous tribes live in the rainforest.



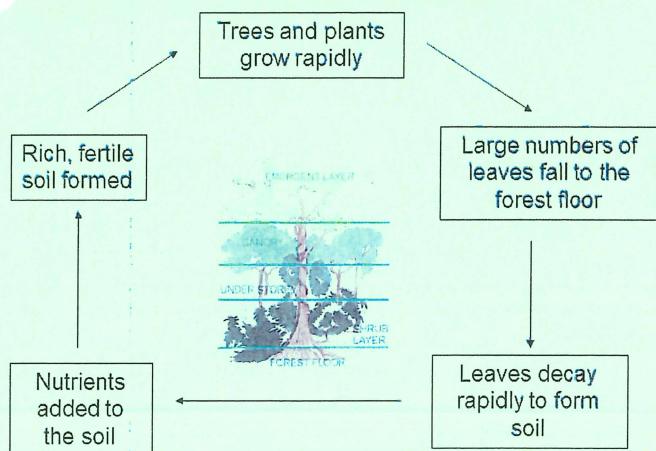
The water cycle in the Amazon rainforest

The forest acts as a store of water in between rainfall events.

After a rainstorm it is said that 80 per cent of the rainfall is transferred back to the atmosphere by evaporation and transpiration.



The Nutrient Cycle in a Tropical Rainforest



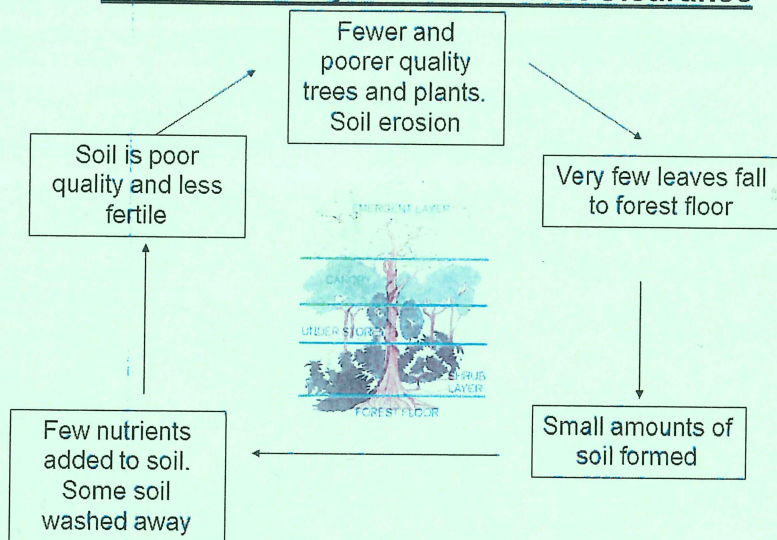
How does economic activity change the ecosystem?

- The removal of trees is called **deforestation** this is happening in the Amazon.
- The **timber industry** is responsible providing wood for paper, furniture and new houses. This has caused large scale destruction as vehicles and machinery drive through the forest.
- **Slash and Burn.** Subsistence farmers clear the forest by burning. After 3 or 4 years of farming the soils become infertile and another patch of the forest is cleared.
- **Cattle ranching for beef.** Grazing animals damages the forest and after about 10 years of

overgrazing the rain turns the land into a semi-desert.

- **Iron-ore mining** at Carajas in Amazonia has destroyed the forest. It is the largest iron ore mine in the world
- **Transport:** A 900km rail link was built to Sao Luis on the coast to export the iron
- **Hydroelectric schemes** like the Tucuri dam in Brazil has led to destruction of the rainforest.

The Nutrient Cycle After Forest Clearance



Effects of rainforest destruction.

- **Change in Bio-diversity** - removal of plants and animals.
- **Change in Hydrology** - The water cycle is disrupted; without the trees interception and transpiration are disrupted, water and silt pour into rivers causing them to flood.
- **Change in soils**. Soils are easily eroded and rain removes nutrients from the soil via surface-runoff and leaching. The soil becomes infertile and there is gullyng and mud slides on steep slopes.
- **Change in climate**. Transpiration is reduced and evaporation increases. This

leads to a dryer climate. Deforestation leads to Global warming because trees use up carbon dioxide in the atmosphere, and this leads to global warming.

- **Effects on groups of people** - indigenous tribes have been forced to leave their land. The movement of people from rural areas to the city (urbanisation) leads to
- problems such as the development of shanty towns (favela's)

What gains and losses have resulted from this change:

Gains:

- Profits from Carajas have helped Brazil to settle other foreign debts
- Long term jobs have been created
- It has encouraged other industries to locate in the area

Losses:

- Native Indians such as the Yanamami have lost their homelands, culture and way of life
- Animals and plants die leading to fewer species and extinction. Some of these species are used for medicinal purposes e.g. rosy periwinkle used for leukaemia treatment

Management of the ecosystem

- Sustainable logging is taking place in many areas. Once a tree is cut down another is planted.
- Plants and trees are harvested for their medicinal value, using the knowledge of the indigenous people. Rainforest products such as rubber, fruits, palm oil, and nuts are harvested and only selective tree felling is being developed.
- Areas of rainforests have been designated as protected areas, where no development can take place. Xingu Reserve- Protected rainforest which is home to the Kayapo tribe
- Consumers in MEDC's are given information about where the wood they buy has come from and are encouraged to buy from sustainable sources.
- Debt-for-nature swaps - poor countries can 'swap' the debt they have with a rich country if they protect an area of rainforest
- Wildlife corridors - link up fragmented areas of land with corridors of vegetation so animals can find enough food and to reproduce.

1. (BORNEO) SOUTH EAST ASIA –causes/ rates of deforestation

A TROPICAL
RAINFOREST BIOME

Where/ location:

Location –

Borneo (the 3rd largest island in the world) is located in **South East Asia**. The island is politically divided among three countries: **Malaysia and Brunei** in the north, and Indonesia to the south.



Causes of deforestation in Borneo

1. **Logging** – Malaysia was the biggest exporter of tropical wood in the 1980s. Clear felling used to take place but not more selective logging is common. Illegal logging is a massive problem (up to 85%).
2. Roads are constructed to provide access to new areas.
3. **Energy development** – The **Bakun Dam** opened in **2011 after 50 years** of delays, it's the highest dam outside China and it flooded 700km² of forest and farmland.
4. **Mineral extraction** – mining for tin is common, they are also drilling for oil and gas.
5. **Population pressure** – in the past the poor urban population were encouraged to move to migrate to the countryside to ease overcrowding. Approx. **15,000 hectares** of forest were felled for new settlers up to the **1980s**.
6. **Commercial farming** – Malaysia is the biggest exporter of palm oil in the world, plantation owners receive tax incentives promoting growth. Indonesian government has set a target to increase oil palm production from **20 million tonnes** in 2009 to **40 million tonnes in 2020**.
7. **Subsistence farming** – tribal communities traditionally hunt and gather food from the forest and *grow small scale, sustainable crops*. Slash and burn is a technique used to clean land and create valuable nutrients, the fires can grow out of control.

2. (BORNEO), SOUTH EAST ASIA –effects of deforestation

AO3: Evaluation – A likely question may ask to divide into social/ economic/ environmental/ political. Also make sure you **classify** into SHORT/ LONG/ LOCAL/-NATIONAL/ GLOBAL.

A TROPICAL
RAINFOREST BIOME

Where/ location:

Location –

Borneo (the 3rd largest island in the world) is located in **South East Asia**. The island is politically divided among three countries: **Malaysia and Brunei** in the north, and Indonesia to the south.



Effects of deforestation

ENV Soil erosion – Exposed soil that could have taken 100s of years to form can be washed away in a few hours.

ENV Loss of biodiversity - as the ecosystems are destroyed, habitats in trees and on the ground are destroyed. Borneo is home to 221 species of mammals, 620 species of birds, 35% out of its 15,000 plant species that are found nowhere else.

ENV Climate change – as photosynthesis is decreased and burning increases greenhouse gases, plus less water in the atmosphere due to reduced transpiration gives a drier climate

ECONOMIC Economy – Driven by profit, deforestation creates jobs, companies pay government taxes (improve local services), improve infrastructure, provides raw materials for manufacturing industries, hydroelectric power is cheap, minerals e.g. gold is valuable. However, Plants that could bring medical breakthroughs and profits are lost, climate change means adaptation, tourism decreases, fires can destroy valuable forest.

3. (BORNEO), SOUTH EAST ASIA –SUSTAINABLE MANAGEMENT of deforestation

AO3: Evaluation – A likely question may ask to you assess the success of rainforest management.

A TROPICAL
RAINFOREST BIOME

Where/ location:

Location –

Borneo (the 3rd largest island in the world) is located in **South East Asia**. The island is politically divided among three countries: **Malaysia and Brunei** in the north, and Indonesia to the south.



1. Management strategies:

- a) Create more National Parks and reserves for the local people (soc/ env)
- b) Only give logging grants to companies that promise to replant an equal number to those that they fell (ec/ env)
- c) Reduce international trade in endangered hardwoods, such as Mahogany (env/ec)
- d) Limit the mass burning of trees to reduce global warming and climate change (env)

2. Encourage Ecotourism:

- a) Travel to protected areas that is low impact and (often) small scale (environmental/ cultural)
- b) It helps educate the traveller; directly benefits local communities and fosters respect for different cultures and for human rights (social/ cultural)
- c) Much more of the money goes directly to the local people and the environment

Aims of AONB: Special and unique qualities of the landscape, wildlife and cultural heritage are recognised and conserved.

Shropshire Hills (Honeypot site)

Background

Striperstones is a rocky ridge in the Shropshire Hills AONB. It has good access links to towns and cities of the West Midlands. The hills are not large. The peaks are not too large (400m) above sea level and the slopes not too steep- therefore ideal for tourism – cycling, walking, running.

Issues

- **Thin soils** – more vulnerable to erosion, comined with **rocky outcrops (tors)** stick out. The tors attract climbers. **Trampling repeatedly has damaged vegetation** and let to further erosion. This has left scars.

Overall evaluation:

This case study considers how AONB (areas of natural beauty) can be protected by focusing on **sustainable management**. Another way you could use this case study is to suggest ways of measuring the impact of tourists on the environment. **Sampling strategies** could be part of the questions, to provide us with a good understanding of what is happening in the AONB.

How is the Shropshire Hills AONB managed?

The five year period- 2014-19

*Who? Full time staff /large numbers of volunteers.

*Management plans over a five year period, with clear action points:

1. Information that celebrates the National Nature Reserve and outlines it's importance.
2. Photography used to monitor landscape change (at key locations)
3. Celebrate local produce and food (to support local businesses)
4. Develop guidance on how renewable energy can be developed (limiting any impact on local wildlife)
5. Develop a programme to promote cycling in wider Shropshire Hills.
6. Training opportunities for conservation volunteers
7. Promote discovery and visitor information at the Shropshire Hills discovery centre.

The sand dunes are managed by the Countryside Council for Wales (CCW). The aims are to 'protect and maintain the wildlife in the reserve'. To allow public access as is compatible with conservation and research.

Ynyslas sand dunes (Honeypot site)

Background

Ynyslas sand dunes are in West Wales. People visit for relaxation on the beach or in the sand dunes or to enjoy a number of leisure activities that include walking, riding, sailing and bird watching. Ynyslas at the mouth of the Dyfi estuary and became a National Nature Reserve in 1969.

Issues

-Sand dunes –vulnerable to erosion from trampling. During 1960's sand dune system had been damaged by off road vehicles. In some places the marram grass, the roots of which help bind the loose sand, had been destroyed. The wind had then eroded huge hollows creating ugly scars called BLOW- OUTS

Overall evaluation: This case study considers how this rural landscape can be protected by focusing on sustainable management. Another way you could use this case study is to suggest ways of measuring the impact of tourists on the environment. **Sampling strategies** could be part of the questions, to provide us with a good understanding of what is happening in the National Nature Reserve.

How has the landscape been managed?

1969-2016

1969- Sank fences into the sand to stop vehicular access. Wooden boardwalks in two places to stop further trampling.

1980's Fenced off vulnerable areas. Wind traps to encourage layers of sand to be deposited. Planted marram grass and erected information signs.

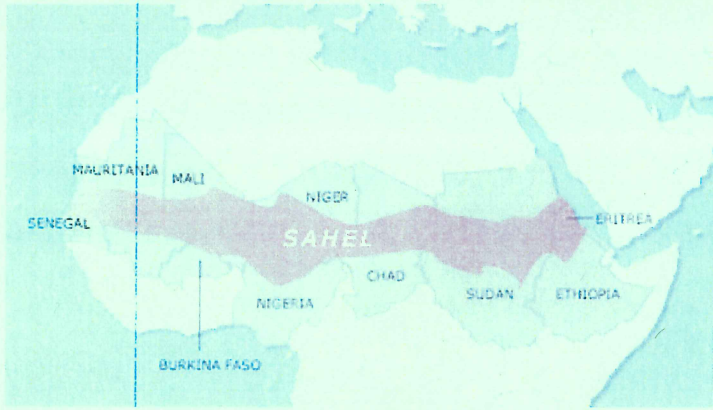
1990's Removed the fences. New areas of trampling had occurred. Litter bins used around the site.

2000's- Litter bins removed. Fenced off areas to protect ground nesting birds such as the skylark.

2016- Improved visitor centre and boardwalk to allow wheelchair access. Dog fouling is now a big concern since the local beach banned dog walking in the summer months.

Case study 9 - Sahel Region, Africa

Case study of an area suffering from desertification: causes, effects and management



Desertification is when the desert gradually spreads to the surrounding areas of semi-desert.

The Sahel is located in the southern region of the Sahara desert, Africa. It is an area which is experiencing desertification. T

The reasons for desertification in the Sahel are as follows: Physical Causes

Cause	Explanation	Solution
Climate change and drought	A change in global climate has caused more droughts than normal. This damages animal's habitats and the soil in many areas. This also leads to famine in the long term as crops die. Disease is prevalent due to poor water quality.	Irrigation schemes or dams to store water for use on farmers' fields. Provide each area with the ability to collect water from a well or using play pumps.
Variations in seasonal rainfall and high evapotranspiration rates	Rainfall only occurs in one part of the year leading to water stress in the other parts of the year. Crops grown are limited due to high evapotranspiration rates	Storing water during the rainy season to reduce water stress. Plant more drought tolerant crops.
High pressure systems	Strong high pressure systems in North Africa prevent warm, wet air moving towards.	None

Human Causes

Problems	Description	Solution
Over cultivation	Too many crops are grown on the same area of land. Nutrients are exhausted. Vegetation will no longer grow. Soil exposed to wind and rain.	Crop rotation - farmers should grow different crops from year to year. Fields should be taken out of production to allow the recovery of nutrients. Plant trees and hedges as a wind break.
Overgrazing	Too many animals are kept on an area of land, vegetation cover is removed, wind and rain erode the soil.	Rotate animals on different fields. FARM AFRICA (NGO) Dairy Goat Project. Replace cattle for goats, removal of less vegetation, manure used for kitchen gardens, breed goats for food and income.
Deforestation	Farmers remove woodlands and hedgerows. Less protection from the wind and rain lead to increase in erosion.	Afforestation - planting trees. Roots help bind the soil together.
Up and down ploughing	This is when farmers plough up and down hills. Rainfall flows down furrows removing top soil.	Farmers should plough following contours. Lay bunds (stone lines) to stop the soil for washing away.

North-east Africa - RIVER NILE

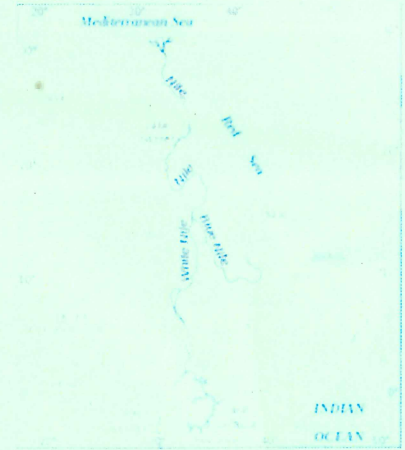
A case study of a trans boundary water issue

Why is there an issue over water?

The issue is between many of the countries in north-east Africa. The main focus of the conflict is over the use and control of the River Nile.

The River Nile flows through Uganda, Ethiopia, Sudan and Egypt.

For a decade, the countries in the Nile Basin have been negotiating about how to share - and protect - the river at a time of changing climate and a rising population. The talks eventually broke down in 2010. On one side are Egypt and Sudan, which rely heavily on the Nile's water because of their dry climates. On the other side are the remaining countries, which actually supply most of the Nile's water.



Uganda

The Ugandan population is expected to triple by 2050, to 97 million - raising demand for food and water. The government's priority is to build dams to produce electricity, which will restrict the flow of water to the downstream countries of Sudan and Egypt.

Sudan

The Blue Nile and White Nile meet in Sudan.

Southern Sudan has swamps and rainforests, but a large part of the north is the Nubian Desert.

Sudan is facing the problems of desertification and a falling water table.

The Sudanese government wants to expand the use of irrigation to increase the food supply, which will mean taking more water from the Nile.

Ethiopia

Ethiopia's population was 85 million in 2010, but a high population growth rate of 3.2% means that the population is expected to reach 150 million by 2050 - leading to greater demands for both food and water.

With the pressure of its growing population, Ethiopia wants to keep more of the Nile's water for its own needs. This is likely to lead to serious disputes with Sudan and Egypt if they receive less water as a result.

The Ethiopian government wants to build big dams to create hydroelectric power, which can be exported to neighbouring countries to generate much-needed income.

Egypt

Egypt's population was 79 million in 2010, but is expected to rise to 122 million by 2050 - leading to a massive increase in demand for water and food.

The country relies on the Nile for 90% of its water supply. The Nile's water is used to irrigate farmland on either side of the river - allowing crops to be grown for domestic use and for export (to meet the growing global demand).

How is the issue being resolved?

Pan African Conference - the Governments were invited to a conference to discuss their views on how the River Nile should be managed. It was decided to carefully regulate the flow of the Aswan Dam so not to affect people living in Egypt. Egypt give money to the Government in Sudan so that communities can develop wells to help save water and allow them to have a better quality of life. The UN has been working with communities in Sudan to reduce desertification by placing stones in lines to trap sand and water.